



April 25, 2011

Dr. Mary Neu, Chief Scientist
Office of Environmental Management
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

Mr. Matt McCormick, Manager
Richland Operations Office
United States Department of Energy
P.O. Box 550; MSIN: A7-50
Richland, WA 99352

Re: Vadose Zone Industrial Cleanup Technologies Workshop and Recommendations
for Future Action

Dear Dr. Neu and Mr. McCormick:

We appreciate the United States Department of Energy Office of Environmental Management's commitment to a dedicated vadose zone and groundwater cleanup at the Hanford Site. We understand that cleanup and protection of the Columbia River is a priority for all of us.

On January 19, 2011, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), the Yakama Indian Nation (YN), the Oregon State Department of Energy, the Nez Perce Tribe, and the Washington State Department of Ecology hosted a "Vadose Zone Industrial Cleanup Technologies Workshop." Technologies currently used in the mining and demolition industries were reviewed and evaluated for possible application to vadose zone contaminant remediation at the Hanford Site. The enclosure contains a summary of the presentations from the workshop.

The United States Department of Energy (USDOE) has identified remediation of the vadose zone as one of the major issues for controlling long-term risk at the Hanford Site. The recent draft Tank Closure and Waste Management Environmental Impact Statement made it clear that Hanford groundwater and the Columbia River will be at very high risk for thousands of years from contamination already in the vadose zone if it is not treated or removed.

In 2008, USDOE issued a Deep Vadose Treatability Test Plan for the Central Plateau, DOE/RL-2007, which included a list of generic remediation technologies. Our perception of that plan is that it does not include large-scale excavation, mining, in-situ extraction, and other well-proven technologies. We understand that USDOE is still open to adding technologies for consideration at Hanford.

Through the workshop, we hoped all parties concerned with Hanford could have a better understanding of the potential application of the current uses and limitations of large-scale excavation, in-situ extraction, and other technologies, and whether they would provide safer, quicker, and less costly remediation at Hanford.

The workshop demonstrated that there are simpler, lower-cost solutions currently being used outside of Hanford. Some of these technologies, with little adaptation, might be applicable and cost-effective solutions for Hanford vadose zone remediation. We recommend that some of these technologies be evaluated in the ongoing technology screening process for the Deep Vadose Zone Program.

The workshop was well attended by a wide array of representatives, including those from the three Tribal Nations, the Consortium for Risk Evaluation with Stakeholder Participation, the Hanford Advisory Board, the Oregon Hanford Cleanup Board, Pacific Northwest National Laboratory, U.S. Environmental Protection Agency, USDOE, and Hanford contractors. A short debriefing at the end of the workshop produced a number of pertinent comments, including:

- There is some disappointment over the loss of other similar technology forums (for example, the Site Technology Coordination Group).
- There is a need for a meaningful technology workshop that involves participation of outside experts, external vendors, and other experienced users or providers.
- More public information about the vadose zone strategy is needed.

The Deep Vadose Zone Treatability Test Plan lists broad categories of remedies in addition to removal or excavation. The remedies include:

- Containment (barriers and soil stabilization).
- Disposal options.
- *Ex situ* treatment (thermal, physical/chemical and biological).
- *In situ* treatment (immobilization by thermal, chemical/physical, and biological processes, and natural attenuation).

Nearly all of these technologies being considered rely on leaving the contaminants in place.

There has not been a good dialogue regarding the technical aspects of benefits, costs, and concerns with the wide range of technologies already in application. We ask that USDOE put on other technology workshops so that regulators and stakeholders can hear of experiences at other sites, in commercial applications, and by vendors, to understand our options for the remediation of the deep vadose zone.

As a follow-up to this workshop, we have developed a list of future activities that we would like to see implemented to test the effectiveness of using commercially available technologies at Hanford. This list includes:

1. The use of remotely operated and robotic adaption in areas where the risk to workers would be high. Examples include excavation equipment used to expose the tank farm facilities, pipelines, buildings, and other infrastructure at Hanford.
2. A demonstration of molten wax exposure protection. This can be applied to contamination control from excavating and earth moving equipment. It can also create below-ground barriers to prevent further migration and surface barriers to limit water migration until the site can be excavated.
3. A demonstration of tank deconstruction and removal. Perform a pilot test to evaluate the technologies for cutting up a tank and removing it. This removal will allow access to the contaminated soils in the vadose zone beneath the tanks where leaks and overflows occurred. This removal technology also applies to other large structures that have contamination beneath them, including the reactor foundations.
4. A trial excavation to a moderate-depth contamination zone. USDOE and the current contractors have stated that the practical limit of depth for excavation for the 200 Area is about 15 to 20 feet below the surface at Hanford. Excavation in the 100 Area has sometimes been as deep as 60 feet. With the proper equipment, this depth of excavation can be extended much deeper. A drag line, for one example, can go down as far as 250 feet below the surface from one location and at a reasonable cost (see attachment).
5. Continue collaboration with the United States Geological Survey and the Environmental Protection Agency on adapting in-situ uranium recovery processes that could be used to remediate very deep vadose zone or groundwater hosted uranium, plutonium, and technetium contamination deposits through extraction (solution mining) techniques.
6. A demonstration soil washing site. As contaminated soil is brought out of the ground, it can be leached, cleaned, and returned. This process can be used to remove the contaminants that pose a risk to groundwater and the Columbia River, and potentially enable the replacement of cleaned soils rather than (re)burying contaminated soils and acquiring new soil sources for clean backfill.

The presentations from the January 19 workshop are available to be viewed. The presenters are willing to further discuss the technology they presented and how it may make the cleanup of Hanford safer, quicker, and more economical.

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We would be happy to work with USDOE to help set up more of these workshops and to provide additional ideas for outside industry contacts.

Sincerely,

Signature pages attached

Enclosure

cc w/enc:

Craig Cameron, EPA
Dennis Faulk, EPA
Rod Lobos, EPA
Brandt Petrasek, USDOE-EM
Briant Charboneau, USDOE
John Morse, USDOE
Margo Voogd, USDOE
Mark Freshley, PNL
Susan Leckband, HAB Chair
Pam Larson-Brown, HAB RAP Committee
Nancy Kintner-Meyer, GAO
Barbara Harper, CTUIR
Ted Repasky, CTUIR
Sandra Lilligren, NPT
Stan Sobczyk, NPT
Russell Jim, YN
Wade Riggsbee, YN
Shelley Cimon, ODOE
Dale Engstrom, ODOE

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A handwritten signature in black ink, appearing to read 'Stuart Harris', followed by a long horizontal line extending to the right.

Stuart Harris, Director
Department of Science & Engineering
Confederated Tribes of the Umatilla Indian Reservation

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A handwritten signature in black ink, appearing to read 'G. Bohnce', with a long horizontal flourish extending to the right.

Gabriel Bohnce, Director
Environmental Restoration Waste Management Program
Nez Perce Tribe

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A handwritten signature in dark ink, appearing to read 'Philip Rigdon', followed by a long horizontal line that extends to the right.

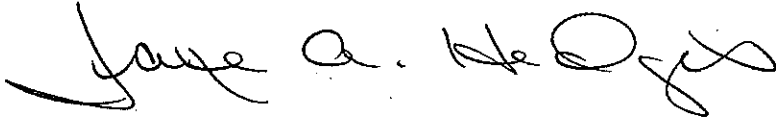
Philip Rigdon, Director
Department of Natural Resources
Yakama Nation

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A handwritten signature in black ink, appearing to read "Ken Niles". The signature is fluid and cursive, with the first name "Ken" and last name "Niles" clearly distinguishable.

Ken Niles, Division Administrator
Nuclear Safety Division
Oregon Department of Energy

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A handwritten signature in black ink, appearing to read "Jane A. Hedges". The signature is fluid and cursive, with a large loop at the end.

Jane A. Hedges, Program Manager
Nuclear Waste Program
Washington State Department of Ecology

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bcc w/enc:

Stuart Harris, CTUIR
Gabriel Bohnee, NPT
Philip Rigdon, YN
Ken Niles, ODOE

bcc electronic w/enc:

Dieter Bohrmann, Ecology
Joe Caggiano, Ecology
Dib Goswami, Ecology
Jane Hedges, Ecology
Zelma Jackson, Ecology
Nina Menard, Ecology
John Price, Ecology
Cheryl Whalen, Ecology

bcc w/enc:

NWP Central Files

bcc w/o enc:

NWP Reader Files

Enclosure

Summary of Presentations from the Vadose Zone Industrial Cleanup Technologies Workshop January 19, 2011

The following are some brief summaries of companies and technologies discussed at the Vadose Zone workshop. These companies are not all-inclusive, and the workshop organizers have no vested interest in any one technology or company representing these technologies.

Under the category of *Large Scale Excavation and Removal Technology*, we heard from:

Caterpillar Corporation: Western States Equipment - Jim Holland

They gave an impressive presentation demonstrating the wide variety of large mining and excavation machinery available to increase the capability to uncover vadose zone contamination. This included robotic and self-autonomous heavy equipment currently being used in the mining industry. This equipment can move a large volume of either waste or vadose zone material to get at the waste quickly with few limits as to the depth they can excavate.

Bucyrus Corporation – Randy Govier

They showed examples of drag-line excavators and demonstrated how efficient and safe they could be at Hanford. With a three-man crew, these drag-lines can move large volumes of material safely, at a distance, at depth, and at a cost of only about \$.50 per cubic yard. In addition, the initial cost of one of these machines is offset by the longevity of the equipment. Bucyrus equipment was used extensively and was key for digging the Panama Canal.

Under the category of *Demolition*, we heard from:

Blue Grass Company – Robert Hulick

He showed that wireline cutting of concrete, metal, and any other substance can easily be done at the Hanford site. There is no limit on the size of structure that can be cut with the diamond wireline. In fact, this technology is already being used safely at the Hanford 324-B facility and other highly radiologically contaminated sites. It produces minimal dust, which is easily controlled and contained. This demolition technology can easily be adapted to take down reactors, large buildings, and even cut up underground tanks.

Ridolfi, Inc. – Eric Duer, Geological Engineer

He discussed various in-situ containment technologies and showed examples of soil washing and heap leach fields that are used for uranium extraction and recovery.

The timing of the workshop did not allow us to bring in a representative from the industry to discuss in-situ uranium recovery, but we did hear from three United States Government regulators:

Valois Shea – United States Environmental Protection Agency (EPA), Denver, CO

Elise Striz – United States Nuclear Regulatory Commission (NRC), Washington D.C.

Susan Hall – United States Geological Survey (USGS), Denver CO

**Summary of Presentations from the
Vadose Zone Industrial Cleanup Technologies Workshop
January 19, 2011**

They demonstrated how in-situ recovery techniques have evolved into safe, effective, and restorable technology. This included a briefing on how the recovery technology works and how EPA regulates the miners and the process.

Ms. Striz talked about how carefully the EPA and NRC monitor for process failure and make sure that aquifer recovery occurs. Ms. Hall went into more detail about how the USGS and others are researching various technologies to improve post-mining aquifer recover. There was a discussion about how there are mines in the United States operating now in unconfined aquifers, and plans to attempt recovery from vadose zone deposits.

Under the category of *Contamination and Exposure Control*, we heard from:

Carter Technologies – Ernie Carter

He gave a very impressive demonstration of how molten wax could be sprayed to entrap and suppress dust and loose sediments, how it can prevent collapse, it can form a quick and economical water barrier over a contaminated site, it can block radiation, and contain radiation contamination under a building or other structures.

And finally, under the category of *Robotics and Remotely Operated Technology*, we heard from:

Dr. Robert Whittaker, Director of the Robotic Science and Technology, Carnegie Mellon University, PA

Dr. Sam Khart with Caterpillar Autonomous Systems

Dr. Michael Larranaga, Department Head, General Engineering, Oklahoma State University; Director, Boots & Coots Center for Fire, Safety, and Pressure Control; Director, United States Department of Homeland Security Scholars Program

These three presenters gave a very detailed overview of how remotely operated machinery can be used effectively in locations that are dangerous for the operators.

Dr. Whittaker and Dr. Khart showed a number of applications now being used in the mining industry where mine machinery is totally autonomous and performs excavation and hauling task routines with little human input. In addition, remotely operated mining machines and trucks are being operated or monitored from operational centers hundreds of miles away.

Dr. Whittaker's presentation included a couple of remotely operated machines already in use at Hanford.

Dr. Larranaga demonstrated how machines are currently being used to de-mine war areas, and bomb disposal machines with manipulators are valuable to those efforts.

All of these resources, with very little adaptation, are applicable to remediation of dangerous waste sites and facilities at Hanford.